Measuring Beliefs Supportive of Environmental Action and Inaction: A Reinterpretation of the Awareness of Consequences Scale

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Measuring Beliefs Supportive of Environmental Action and Inaction: A Reinterpretation of the Awareness of Consequences Scale[1]

by

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ABSTRACT[4]

The Value-Belief-Norm model assumes that egoistic, social-altruistic and biospheric value orientations causally influence how people cognitively structure beliefs regarding adverse environmental consequences. Empirical studies have administered the Awareness of Consequences (AC) scale to differentiate between these three orientations. We report an analysis which challenges previous work in the field. Evidence is presented that indicates the AC scale should be reinterpreted as a measure of beliefs supporting environmental action and beliefs supporting environmental inaction. The beliefs supporting environmental action appear to be differentiable according to beliefs in the positive consequences from environmental protection and the seriousness of environment harm. This has major implications for the Value-Belief-Norm model and its application.

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[4] This paper updates Ryan and Spash (2008) presenting new analysis and information. In particular we have renamed the proposed scales

INTRODUCTION

Climate change, biodiversity loss, pollution of air, water and soil, and resource shortages are some of the environmental challenges of the 21st Century. Tackling ecological problems implies modifying a range of human behaviours conducted by the whole spectrum of societal actors from the individual citizen to corporations and governments. A variety of motives may stimulate or prevent action. Theoretical models can help identify key drivers and obstacles to achieving behavioural change. Policy relevant behavioural models provide a descriptive account of the interactions between variables and are subject to empirical testing. Developing such models has been the aim of social psychologists working on environmental problems. Psychometric scales are then typically employed to measure attitudes and beliefs, which are sometimes connected to foundational values. Such attitudes and beliefs are regarded as key explanatory variables for human behaviour.

Since Heberlein (1981) noted the need for understanding how people cognitively organise beliefs and feelings about environmental issues there has been a growth in environmental attitude-behaviour research resulting in a range of models (Ajzen, 1991; Grob, 1995; Homburg & Stolberg, 2006; Ohtomo & Hirose, 2007). However, developing environmental scales is difficult because environmental issues are inherently complex, involve multiple perspectives and plural values (Spash, 2000a). Recent studies (Hawcroft & Milfont, 2010; Milfont & Duckitt, 2004) have challenged the interpretation of two widely employed scales, the New Environmental Paradigm (NEP) (Dunlap & Van Liere, 1978; Dunlap, Van Liere, Mertig, & Jones, 2000) and the Ecocentric and Anthropocentric Environmental Attitude scale (Thompson & Barton, 1994), alongside several less popular scales.

The current study critically investigates environmental scales arising from the Value-Belief-Norm (VBN) model of Stern and colleagues (Stern, 2000; Stern, Dietz, Abel,

Guagnano, & Kalof, 1999). Stern, Dietz and Kalof (1993) integrated assumptions made by several other theories into a broader behavioural framework of environmental intentions which developed into the VBN. This has become one of the most popular and prominent behavioural models in environmental psychology (De Groot & Steg, 2007, 2008; Kaiser, Hübner, & Bogner, 2005; Nordlund & Garvill, 2003; Oreg & Katz-Gerro, 2006; Steg & De Groot, 2008; Steg, Dreijerink, & Abrahamse, 2005).

The VBN model proposes that value orientations influence various environmental perceptions and behaviour. It outlines three value orientations related to the ego, social-altruism and the biosphere (Stern, Dietz, & Guagnano, 1995a), which are expected to be distinguishable although correlated (Stern, Dietz, & Kalof, 1993). The value orientations are hypothesised to directly influence the way in which people formulate and structure environmental beliefs (Stern, 2000). Psychological scales have been developed to measure the models' proposed environmental beliefs. These scales have then been administered in studies that examine various environmental behaviours, such as political action and willingness to pay for environmental improvements. There have also been attempts to use the value orientation based belief scales to interpret contingent valuation on the basis of whether people are egoistically, altruistically or biospherically motivated (see review in Spash 2000b and Spash 2006).

However, studies attempting to demonstrate that people cognitively differentiate between beliefs about egoistic, social-altruistic and biospheric consequences, have given mixed empirical results. Two approaches have been employed: the Environmental Concern (EC) scale and the AC scale. Table 1 displays examples of EC and AC questions as used to create the scales. Applications using the EC scale have provided supporting evidence that people do cognitively construct their environmental concerns consistent with the three VBN value orientations (Hansla, Gamble, Juliusson, & Gärling, 2008; Milfont, Duckitt, &

Cameron, 2006; Schultz, 2000, 2001; Schultz, Shriver, Tabanico, & Khazian, 2004; Snelgar, 2006), while those employing the AC scale have reported poor subscale reliabilities, theoretically inconsistent subscale correlations and poor dimensionality (Gärling, Fujii, Gärling, & Jakobsson, 2003; Hansla et al., 2008; Joireman, Lasane, Bennett, Richards, & Solaimani, 2001; Stern et al., 1993; Stern, Dietz, Kalof, & Guagnano, 1995b). Whether the AC scale is a good measure of the three underlying value orientations has been questioned (Snelgar, 2006; Spash, 2006). Even Stern and colleagues (Stern et al., 1995a; Stern et al., 1995b) have concluded that the AC scale measures only a single General Awareness of Consequences (GAC) construct. However, no study has yet investigated the possibility that the AC scale may be measuring an alternative cognitive process for explaining behaviour.

Table 1. Example of EC and AC scale items

Items	Awareness of Consequence Scale	Environmental Concern Scale
Egoistic	Environmental protection will provide a better world for me and my children. Protecting the environment will threaten jobs for people like me.	I am concerned about environmental problems because of the consequences for - My lifestyle - My health
Social/Altruistic	Environmental protection will help people have a better quality of life. The effects of pollution on public health are worse than we realise.	I am concerned about environmental problems because of the consequences for - All people - People in the community
Biospheric	Over the next several decades thousands of species will become extinct. Claims that current levels of pollution are changing earth's climate are exaggerated.	I am concerned about environmental problems because of the consequences for - Birds - Plants

This paper aims to do so by reanalysing previously reported data. Across two studies, three samples (N=572, 511, 531) were collected in face-to-face interviews with members of the general public in the United Kingdom (UK) as part of on-going work relating to economic valuation of the environment using contingent valuation (Spash, 2000c, 2006; Spash et al., 2009). Previously published results from the first study, see Spash (2006), were interpreted as consistent with a separation between selfish-altruism (the concept of altruism found in mainstream economics), where gain to others is of direct benefit to the individual, and social-altruism, where benefiting others is an end in itself. The AC social-altruistic scale can then be seen as a mixture of items from these two categories. The evidence supported the idea of selfish-altruism being related to egoism while social-altruism was associated with biospherism, i.e. a two factor solution. This paper reanalyses data from the first Spash (2006) study and analyses new data from a second study. The results reported here indicate that AC scale factors are not oriented towards the self, others or the biosphere. It is also proposed that the AC scale does not simply measure a one factor solution and therefore interpreting the content and meaning of the scale requires reconceptualising the model.

The next section describes the VBN model along with the role of the AC scale as developed in the literature. Specific items behind the scale are discussed and issues arising from published empirical work are reported. Section 3 explores an alternative approach to understanding the results. Section 4 describes our data and methods, and section 5 the results which are discussed in section 6.

AWARENESS OF CONSEQUENCES THEORY AND MEASUREMENT

Stern et al.'s (1993) social psychological theory is based on assumptions originating in Schwartz's (1977) Norm Activation Model. The latter describes altruistic behaviour as the result of an individual being explicitly aware of consequences in terms of the social harm of

not performing a particular behaviour and that they accept responsibility for the performance of that behaviour. Awareness of consequences combined with accepting responsibility increases the probability that a person will feel morally obliged to act. The VBN model changes Schwartz's definition in two ways. First, the "awareness of harmful consequences" construct, which originally described an explicit awareness of consequences, is extended to include beliefs about potential future world states. For example, an individual may believe that "thousands of species will die within the next decade", which may or may not happen. Second, an individual's awareness of adverse consequences is assumed to be organised around the three value orientations pertaining to oneself, other humans and non-humans. A diagrammatic depiction of the VBN model is presented in Figure 1.

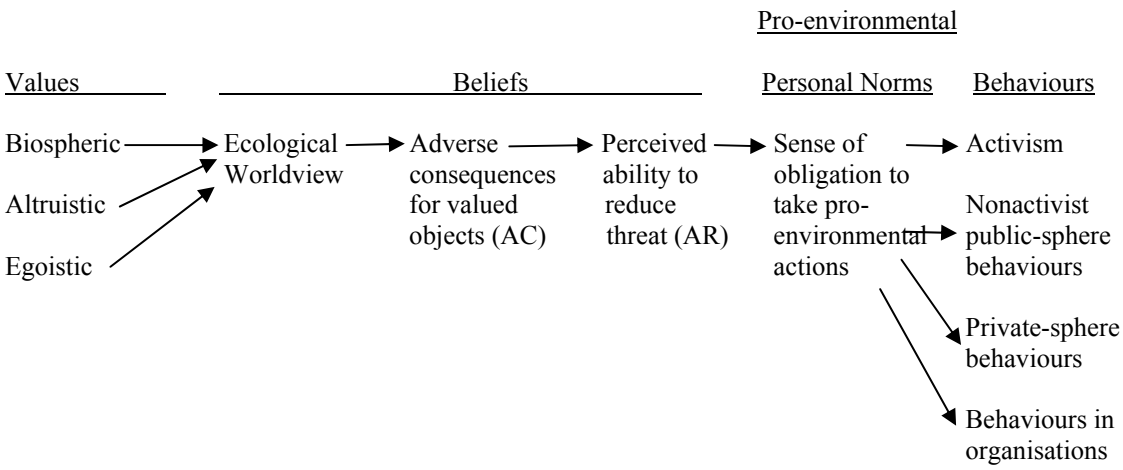

Figure 1. The VBN model (adapted from Stern, 2000)

Stern et al. (1993) describe the three value orientations as logically distinct relationships concerning self interest, altruism towards other humans, and altruism towards other species and the biosphere. The value orientations are defined as being guiding principles regarding states or outcomes that are desirable or appropriate (Rokeach, 1973; Schwartz, 1992; Stern et al., 1999). The VBN theory posits that an individual's value orientation causally influences their beliefs relating to adverse consequences, because factual

information congruent with an individual's value orientation is given more weight than value-incongruent information (Stern, 2000; Stern & Dietz, 1994; Stern et al., 1999). That is: "A strong value orientation may lead someone to seek information selectively or to attend selectively to information about the consequences of an environmental condition for particular valued objects, and therefore to develop beliefs about those consequences that will guide action" (Stern & Dietz, 1994, p.68). Thus, an individual is assumed to be more receptive to certain information depending upon their value orientation which then causally influences their beliefs. At the same time, Stern et al. (1995a) note that beliefs can be judged according to criteria of truthfulness, because "beliefs…are in principle vulnerable to empirical challenge" (p.727-8). This second possibility, however, has not been formally included in the VBN model.

In defining attitudes, the theory of planned behaviour (Ajzen, 1991) also refers to the concept of beliefs. Attitudes are described as comprising an assessment of outcome desirability and of the subjective probability that a behaviour will produce a certain outcome. Ajzen (1991) refers to the pragmatic subjective probability component of an attitude as being a belief. In contrast, the VBN lacks a formal process by which factual information can influence beliefs regarding adverse environmental consequences. The theorised VBN link between value orientations and beliefs may be weakened by believable freely available information which proves incompatible with an individual's value orientation. For example, the mass media may convince an individual that many species may die in the near future, even if that person has a weak biospheric value orientation.

The EC construct can be distinguished from beliefs about adverse environmental consequences. EC has been defined as being rooted in feelings of interconnectedness and empathy with regards to others or the natural environment (Schultz, 2000, 2001). Value orientations may bias information processing via an affective or emotive process that

ultimately influences what an individual is concerned about rather than what they factually believe. Under such circumstances, the EC construct would be expected to have a closer relationship with egoistic, altruistic and biospheric orientations than beliefs concerning factual statements about the environment.

Whether people cognitively differentiate their environmental concerns and beliefs based upon Stern et al.'s proposed value orientations is a hypothesis open to empirical investigation. The EC scale constructed by Schultz (2000) has produced the most supportive results. As displayed in Table 1, the EC scale employs the statement: *I am concerned about environmental problems because of consequences for '_____'*. Respondents are then asked to rate nouns such as: me, my health, people in the community, future generations, plants, trees, whales. EC studies have reported exploratory and confirmatory analyses that support the hypothesised factor structure, as well as strong subscale reliabilities and reasonably interpretable correlations between subscales (Hansla et al., 2008; Milfont et al., 2006; Schultz, 2000, 2001; Schultz et al., 2004; Snelgar, 2006). Such results provide evidence that people do differentiate adverse environmental concerns according to the proposed value orientations.

The items in the AC scale seem to have been designed based on a factual cause and consequence formula. Each item is a statement proposing that a cause (e.g., pollution, environmental protection) will affect a target, i.e., either oneself (ACego), others (ACsoc), or the biosphere (ACbio). For example, a biospheric item might be related to the problem of tropical deforestation, with the consequences being for the Earth as a whole, producing an item statement: "Tropical rain forests are essential to maintaining a healthy planet Earth". The wording of items is generally kept simple and there appears a desire for some variety of positively and negatively phrased questions on each AC category to construct the overall scale. Yet, within this structure alternative interpretations of an item seem possible and the

task facing a respondent can involve unforseen complexities. Respondents may then interpret the AC items and cluster them based on alternative and unexpected criteria.

Closed-ended questionnaire items must present participants with a restricted representation of an issue. Wording and framing of items are well known influences on how people interpret the meaning of a questionnaire (Tversky & Kahneman, 1981; Wang, Simons, & Bredart, 2001). Linguistic and cognitive scientists (Croft & Cruse, 2004; Lakoff, 1987; Pinker, 1998, 2007) have also noted that some variations of a statement or sentence will result in a listener or reader extracting precisely the same meaning, while others, with seemingly subtle sentence variations, can result in the recipient forming radically different interpretations. Similarly, item sequence, the response scale and the overall questionnaire format can influence responses (Schwarz, 1999, 2007a, 2007b; Schwarz & Bohner, 2001; Schwarz & Strack, 1991). Hence, constructing an instrument that successfully differentiates between VBN value orientations requires more than simply designing a set of items which mention consequences affecting egoistic, social or biospheric targets. In particular, an individual may fail to cognitively construct an interpretation based on their value orientations if confronted by items appearing to be factual statements.

Table 2 displays subscale reliabilities reported by a variety of published studies (Gärling et al., 2003; Hansla et al., 2008; Joireman et al., 2001; Snelgar, 2006; Stern et al., 1993; Stern et al., 1995b). These show weak to moderate results. Early on Stern et al. (1993) reasoned that moderate reliabilities might be due to too few items being administered. However, both Gärling et al. (2003) and Hansla et al. (2008) had to remove an item from each scale in order to improve reliability, while Joireman et al. (2001) reported only moderate reliabilities despite having 4 to 5 item scales. Most studies conclude that a better set of items would improve reliability, and that quest is undoubtedly in turn responsible for the variety found in published versions of the scale.

Table 2 *Published reliability statistics for AC subscales*

	Awareness of Consequences Scales		
	ACego	ACsoc	ACbio
Cronbach's Alpha			
Hansla et al. (2008)	.64 (2 items)	.56 (2 items)	.56 (3 items)
Snelgar (2006)	.30 (4 items)	.56 (5 items)	.46 (4 items)
Gärling et al. (2003)	.45 (2 items)	.42 (2 items)	.54 (2 items)
Joireman et al. (2001)	.67 (4 items)	.76 (5 items)	.65 (4 items)
Theta Reliability			
Stern et al. (1993)	.66 (3 items)	.62 (3 items)	.56 (3 items)
Stern, Dietz, Kalof et al. (1995)	.77 (2 items)	.71 (2 items)	.73 (4 items)

Several versions (i.e. using different items) of the AC scale have reported an assortment of measurement problems, including confusing correlation patterns with other scales, which suggest that the questionnaire might have low construct validity. Schwartz's (1992) self-enhancement scale has been proposed as a measure of egoistic value orientation, while the self-transcendence scale has been proposed as a measure of social-altruistic and biospheric value orientations combined as one factor. Schwartz's self-transcendence and self-enhancement scales have been found to correlate negatively, which suggests that ACego scales should be negatively correlated with ACsoc and ACbio measures. However, studies have regularly reported positive correlations between all AC subscales (Joireman et al., 2001; Snelgar, 2006; Stern et al., 1993). The exception is Hansla et al. (2008) who found that administering a questionnaire including only negatively framed AC items produced a pattern consistent with the ACego scale being negatively correlated with the other two subscales. Of greater concern to the construct validity of the AC scale is the finding that the ACego scale

fails to correlate positively with Schwartz's self enhancement scale (Stern et al., 1995b) or the EC egoistic scale (Snelgar, 2006).

There have also been contradictory claims concerning the dimensionality of the AC scale. Snelgar (2006) has criticised studies (Stern et al., 1993; Stern et al., 1995b) employing a theta scaling procedure because this avoids dimensionality tests. There is no agreement as to how many dimensions the AC scale measures, although the original goal was to assess beliefs relating to the three value orientations. Another major problem has been the high correlation between subscales. Subscales are reported to share the same variance as follows: 18.50% – 36.00% for Stern et al. (1993), 29.16% – 38.44% for Joireman et al. (2001) and 8.24% – 14.98% for Snelgar (2006). While Stern et al. (1993) foresaw the potential for significant correlations between the three AC beliefs, the amount of shared variance is worrisome. Stern et al (1993) take the high correlation between the subscales as an indication that "value orientations may be part of a single perceptual package" (p.340). This conclusion has been supported by studies where principal component analysis (PCA) yielded a one factor solution (Stern et al., 1995a; Stern et al., 1995b). The authors concluded that, rather than being a measure of the three value orientations, the AC scale measures a single construct, the aforementioned GAC. Spash (2006), however, found a three factor solution with the first loading most on egoistic and social items, the second on social and biospheric, and the third combining all three value orientations. Snelgar (2006) found from two to five factors could be extracted using principal axis factoring both with varimax and direct oblimin rotations, and also PCA. She concluded: "no clear structure was obtained with any of these analyses. Thus it is not appropriate to attempt to label any of the factors/components" (p.91).

Doubts that the scales accurately measure three distinctive elements has led to calls for improvement by varying the number of items (Stern et al., 1993) or administering negative items only (Hansla et al., 2008). However, Snelgar (2006), who presents a thorough

investigation of the measurement properties of the AC questionnaire, provides the most pessimistic prognosis. Her conclusion is that the EC scale is a better instrument and should be used in preference to the AC scale. However, another possibility is that the AC items are being cognitively categorised using a criteria fundamentally different to the value orientation system hypothesised by VBN authors.

ALTERNATIVE INTERPRETATIONS

A range of researchers have so far expressed concern about the state of the AC questionnaire. If the questionnaire is found to elicit a response pattern that is incompatible with the VBN, this may prove to be a valuable insight into how people cognitively organise environmental beliefs. Noting that respondents fail to adopt the desired response pattern leaves two investigative strategies. One approach is to scrap the scale, start afresh and aim to measure the theoretical model employing a lot more new items and/or a different response scale. The other approach requires investigating why the scale proves a poor measure of the proposed model (Schwarz, 2007b). This would include looking for unexpected questionnaire response patterns which explain how people are constructing their environmental attitudes and beliefs. A response pattern that is consistently found—even when questionnaire context, participant demographics and response scale are varied—would indicate an alternative interpretation of the scale is required.

Previous studies provide some clues for alternative cognitive processes that could account for AC scale responses. Spash (2006) found a factor combining equal loadings across all three value orientations. This was interpreted as "…an anti-environmental sentiment or lack of worry over possible environmental problems and a concern about the potential negative personal consequences of environmental protection" (Spash, 2006, p.611). The implication drawn being that negative egoistic attitudes failed to form part of the egoistic

scale and seemed to separate out. Hansla et al. (2008) found that AC subscale correlations demonstrated a different pattern when using only the items phrased in terms of negative outcomes. These results suggest respondents may sort negative environmental consequences into a distinctive perceptual category and positive consequences into a separate category. In addition, Snelgar (2006: 88) has commented that:

> "As Stern et al. (1993, 1995) framed the value–belief–norm theory, beliefs that the consequences are adverse will result in action. The beliefs part of the theory can also be considered in terms of perceived costs and benefits for valued objects. Behavioural intention will be influenced by the perceived costs and benefits of a particular environmental action for each set of valued objects, weighted according to the individual's relative value orientations."

The PCA matrix reported by Snelgar (2006) also suggests that people might differentiate between the positive and negative consequences of not taking environmental action.

Indeed, there is strong empirical evidence that people are very sensitive as to whether statements are framed as positively or negatively. The theory of planned behaviour, which is a consequentialist theory, suggests that people naturally ascribe a positive or negative value to their attitudes (Ajzen, 1991). Prospect theory (Kahneman & Tversky, 1979) argues that individuals construct a reference point and then treat gains differently from losses. This is supported by the endowment effect (Kahneman, Knetsch, & Thaler, 1990, 1991) and the economic literature contrasting willingness to pay for environmental improvements with willingness to accept compensation for environmental damages (Knetsch, 1994, 2005). A plethora of framing studies, such as Tversky and Kahneman's (1981) Asian disease problem, suggest that choices can depend on whether the task is perceive in terms of gains or losses. Regulatory focus theory (Higgins, 1987, 2000) also suggests that people differentiate between the pursuit of gains and the avoidance of losses, and employ distinctive strategies to

deal with each of these situations. Framing in terms of gains evokes a "promotion-focus" that leads to growth related strategies that strive to obtain an ideal goal. Framing in terms of losses can form a "prevention-focus", resulting in strategies to increase personal security in "what ought to be". Thus, a set of statements mentioning positive or negative consequences for the environment may evoke the distinction between individuals promotion or prevention stance (Semin, Higgins, Gil de Montes, Estourget, & Valencia, 2005), rather than the categories suggested by the VBN model.

Another possible criterion that respondents might employ to categorise AC questionnaire items is whether the items mention environmental protection, which implies the environment is being proactively safeguarded by human action. Some AC items imply environmental action (e.g., "Environmental protection is beneficial to my health"), while others do not (e.g., "The effects of pollution on public health are worse than we realise"; "Claims that we are changing the climate are exaggerated"). Anderson (2003) argues the psychological literature has often ignored fundamental differences between action and inaction, and that, other things being equal, people generally prefer no change. He refers to the principle of "conservation of energy" as an explanation. For example, the option of environmental protection may involve inconvenience and monetary losses that are less salient under inaction. A range of psychological literature finds people prefer to do nothing as opposed to performing an action e.g., status quo bias (Samuelson & Zeckhauser, 1988), omission bias (Ritov & Baron, 1990, 1992), inaction inertia (Tykocinski, Pittman, & Tuttle, 1995) and choice deferral (Dhar, 1996).

In summary, no one has yet provided good evidence that the AC scale is a measure of Stern et al.'s hypothesised structure. The AC scale has been described as providing a one factor solution (Stern et al., 1995a; Stern et al., 1995b) or as being a poor scale (Snelgar, 2006). Yet, the AC scale may still be able to provide some insight into how people construct

their environmental beliefs. There is strong empirical research suggesting people cognitively differentiate between positive and negative outcomes, as well as being sensitive to whether a proposal implies action or inaction. In order to explore whether the AC scale is a measure of an alternative cognitive process, the research reported next compares three public samples collected in the context of willingness to pay surveys and a convenience sample collected by Snelgar (2006). These datasets vary by the context in which the AC scale was administered, as well as sample size, population characteristics, item presentation order and response scale. Bryman (1988) notes that linking concepts to measurement can often be a much more inductive exercise than implied by the classical social science model. In this vein, the approach of the current paper is both exploratory and inductive, while drawing upon a confirmatory analysis.

DATA AND METHOD

In order to analyse the psychometric properties of the AC scale we utilise three data sets collected as part of research on the contingent valuation of environmental proposals. Two of these data sets were collected as part of the same study (i.e., Spash Study 1), but were differentiated based on whether the AC items were presented sequentially or mixed with other questions. In all three of the contingent valuation samples respondents were (i) members of the general public in the UK approached at home by an independent market research company; (ii) recruited via a stratified random sampling procedure; and (iii) verbally administered the AC questions in a face-to-face interview. These surveys were designed and all related research coordinated by Spash and funded as part of European Community projects (see acknowledgments).

Table 3 *AC scale items in recent studies*

	Administered		
	Spash 1	Spash 2	Snelgar (2006)
ACego1: Environmental protection will provide a better world for me and my children	√	√	×
ACego2: Environmental protection is beneficial to my health	√	√	√
ACego3: Protecting the environment will threaten jobs for people like me	√	√	√
ACego4: Laws to protect the environment limit my choice and personal freedoms	√	√	√
ACego5: A clean environment provides me with better opportunities for recreation	√	√	√
ACsoc1: Environmental protection benefits everyone	√	√	√
ACsoc2: Environmental protection will help people have a better quality of life	√	√	√
ACsoc3: We don't need to worry much about the environment because future generations will be better able to deal with these problems than we are	√	√	√
ACsoc4: The effects of pollution on public health are worse than we realise	√	√	√
ACsoc5: Pollution generated here harms people all over the earth	√	√	√
ACbio1: While some local plants and animals may have been harmed by environmental degradation, over the whole earth there has been little effect	×	√	√
ACbio2: Over the next several decades, thousands of species will become extinct	√	√	√
ACbio3: Claims that current levels of pollution are changing earth's climate are exaggerated	√	√	√
ACbio4: Tropical rain forests are essential to maintaining a healthy planet earth	√	√	×
ACbio5: Modern development threatens wildlife	×	×	√

These surveys included 13 AC items designed by Stern and colleagues taken from the following studies Stern et al. (1993), Guagnano, Dietz and Stern (1994), Stern et al. (1995a, b). In reviewing the literature the number of distinct biospheric items was found to be limited to just three and therefore an extra item was designed and added by Spash (Table 3 item ACbio4). Similarly, Snelgar also designed an additional biospheric item (see Table 3 item ACbio5). While the number of items employed seems small for measuring a multi-attribute scale, the work on AC scales has often used even fewer items than in the work by Spash and Snelgar.

Spash Study 1 (random condition and non-random condition)

The survey was conducted to assess the maximum amount people would personally be willing to pay each quarter on their electricity bill over the next year to restore biodiversity in the river Tummel and its surrounding area. In total 1069 people participated in the study. They were residents from several Scottish regions. The questionnaire contained 50 items including the 13 AC items displayed in Table 3. Participants answered the AC questions using a 7 point scale (1 = strongly disagree; 7 = strongly agree).

Two conditions were administered Spash Study 1. One group of participants were administered the AC items in a sequential non-random order, while the other answered the AC items mixed in with other survey questions. These responses from these two conditions were analysed separately because altering the order of questionnaire items can influence responses (Schwarz, 1999; Schwarz, Strack, & Mai, 1991). The *non-random condition* consisted of 528 participants and 511 participants answered all the AC items. For the *random condition* 541 participants were administered the survey of which 531 participants successfully answered all the AC items.

Spash Study 2

A survey was constructed to assess the maximum willingness to pay of individuals for converting a small area of Cambridgeshire farmland into a wetland ecosystem. The participants were 713 members of the public recruited from across the UK, with a national and regional sample split. The questionnaire contained 45 items. In total 572 participants completed the 14 AC items shown in Table 3. Participants responded on a 4-point scale (1 = strongly disagree; 4 = strongly agree).

Table 4 *Summary of the design and demographics of the four samples*

	Spash Study 1 Random	Spash Study 1 Non-Random	Spash Study 2	Snelgar Study
Test type	Verbally administered	Verbally administered	Verbally administered	Pen & paper questionnaire
Sample	N=531, Scotland	N=511, Scotland	N=572, UK national	N=101, University of Westminster
Context of administering AC scale	WTP survey for restoring biodiversity	WTP survey for restoring biodiversity	WTP survey for converting farmland to wetland	Undergraduate course activity
AC items sequential or randomised	Randomly mixed with other survey items	Sequentially administered	Randomly mixed with political action scale	Sequentially administered
Response Scale	7-point scale	7-point scale	4-point scale	7-point scale
Age	60.6% ≤ age 44	59.1% ≤ age 44	57.6% ≤ age 44	Not reported
Gender	53.1% females	48.5% females	59.1% females	Not reported
Education	53.3% left school at age 16	51.5% left school at age 16	52.0% left school at age 16	100% undergraduate students

Table 4 summarises the design of the three samples alongside the design reported by Snelgar (2006). Table 4 highlights the differences in (i) how the scale was administered to participants, (ii) study context, (iii) sample size, (iv) response scale, and (v) whether the items were presented sequentially or mixed with non-AC questionnaire items. Table 4 also presents demographics (i.e., age, gender and education) for the three samples collected by Spash.

The following criteria will be used to assess whether the AC scale demonstrates the pattern proposed by Stern and colleagues: (i) correlations between subscales, (ii) internal consistency and (iii) dimensionality. Any emergent pattern is assessed based on (i) interpretability, (ii) correlations between new factors, (iii) internal consistency and (iv) the results of a confirmatory factor analysis.

RESULTS

Correlations between the subscales proposed by VBN authors are shown in Table 5. Note the correlations between (i) egoistic and social subscales, and (ii) egoistic and biospheric subscales are positive rather than negative as VBN predicts. Indeed, all of the correlations are large and positive. The subscales share between 21% and 45% of the same variance, which suggests that the constructs are partially measuring the same construct as proposed by the GAC interpretation.

Table 5 *Study 1 and 2 Pearson bivariate correlations between AC subscales*

	Egoistic & Social	Egoistic & Biospheric	Social & Biospheric
Spash Study 1: Random	0.66**	0.46**	0.63**
Spash Study 1: Non-random	0.67**	0.57**	0.64**
Spash Study 2	0.67**	0.57**	0.60**

** $p < 0.001$

Cronbach's α reliabilities were calculated. Table 6 displays Cronbach's α for the theoretical subscales for each of the three samples. The social subscale reported moderate reliability. The egoistic and biospheric subscales, however, reported poor reliability.

Table 6 *Study 1 and 2 Cronbach's α for AC subscales*

	Egoistic Scale	Social Scale	Biospheric Scale
Spash Study 1: Random	.60	.70	.44
Spash Study 1: Non-random	.60	.72	.52
Spash Study 2	.56	.69	.53

Exploratory analysis

In order to meet various referees comments we decided to conduct an exploratory analysis on the datasets collected from the two random and non-random conditions administered in Spash Study 1, and then to investigate any emergent patterns on the data collected from Spash Study 2 with a confirmatory factor analysis (CFA). The exploratory analysis employed a principal axis factor analysis (FA). As Stern and colleagues (Stern et al., 1995a; Stern et al., 1995b) proposed a single factor GAC solution, which is supported by the correlations in Table 5, a direct oblimin rotation was employed because this rotation favours a one factor solution. Two principal axis factor analyses with direct oblmin rotations conducted on the two Spash Study 1 datasets were compared with the results of Snelgar's (2006) reported PCA with varimax rotation. Eigenvalue scores being greater than 1 was the criteria employed to select how many components to extract from the PCA. An assessment of scree plots confirmed that this approach was suitable. Table 7 presents the eigenvalues and percentage of variance explained for the Spash Study 1 FA. The non-random study reported a three component solution, while the random study was found to be best described by a two factor solution, although the percentage of variance explained in each study was low.

Table 7 *Eigenvalues and percentage of variance explained*

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Study 1 Non-random						
Factor 1	5.14	39.57	39.57	4.70	36.18	36.18
Factor 2	1.51	11.64	51.21	.83	6.40	42.57
Factor 3	1.16	8.90	60.11	.65	5.00	47.57
Study 1 Random						
Factor 1	4.89	37.62	37.62	4.37	33.60	33.60
Factor 2	1.50	11.53	49.15	.78	5.98	39.58

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is an index for comparing the magnitudes of the observed correlation coefficients to the magnitude of partial correlation coefficients. The results were 0.88 for non-random condition and 0.89 for the random condition. These high KMO indexes provide evidence that the AC items can be grouped into a smaller set of underlying factors. This contradicts Snelgar's (2006) conclusion that the AC scale has no clear factor structure.

In Table 8 the rotated component matrix from Snelgar's (2006) study and two rotated factor matrices from Spash Study 1 are presented alongside each other. All three rotated matrices clearly fail to illustrate the theoretical structure proposed by VBN authors. For example, in all four samples, Factor 1 contains a mixture of egoistic, social and biospheric items. However, the combined rotated component matrix for the four studies does present a consistent loading pattern, but that is not a one factor solution.

An inspection of Table 8 reveals two clusters of items that load on separate factors for all of the samples. There is also some evidence that these two factors can be further divided into a four factor solution. Studying Table 8 reveals that the items ACego3, ACego4, ACsoc3, ACbio1 and ACbio3 consistently load on a different factor to the rest of the items. We interpret these items as representing "beliefs that are supportive of environmental

inaction". All the other items represent "beliefs that are supportive of environmental action". Furthermore, the non-random condition reported a three factor solution, with some of the items referring to "beliefs supportive of environmental action" appearing on Factor 3. We interpret this third factor to represent "beliefs that environmental protection has positive consequences" and "beliefs that the environment is being seriously harmed". In the Snelgar sample the "beliefs that are supportive of environmental inaction" also separated into two components. We interpret these factors as representing "beliefs that environmental protection has negative consequences" and "beliefs that the environment is not being seriously harmed". Therefore, although Table 7 shows only 2 factor and 3 factor solutions, we believe that there is evidence that responses to the AC scale are influenced by whether a statement implies action or inaction. There is also some indication that items that focus on the consequences of environmental action can be differentiated from beliefs about whether or not the environment is being harmed.

Table 8 *Rotated matrix for Spash and Snelgar studies*

	Spash Study 1 FA with Quartimax rotation					Snelgar PA with Varimax rotation		
	Study 1 Non-Random			Study 1 Random		Study 2006		
	1	2	3	1	2	1	2	3
ACego1	**.87**			**.78**				
ACego2	**.76**			**.67**		**.76**		
ACego5	**.71**			**.75**		.33		
ACsoc1	**.68**			**.70**		.55		.38
ACsoc2	**.78**			**.77**		**.61**	.41	
ACbio4	**.75**			**.64**				
ACego3		**.52**			**.47**			**.74**
ACego4		**.54**			**.57**			**.75**
ACsoc3		**.46**		-.36	**.36**		**.74**	
ACbio1							**.72**	
ACbio3		.35					**.72**	
ACsoc4	**.**49		.45	**.55**			.48	
ACsoc5	.59		.51	**.63**		**.65**		
ACbio2	.46		.45	**.53**		.59		
ACbio5						.48		

Note: Factor loadings less than .30 are not reported

Table 9 presents the items for each of the four proposed clusters. The "beliefs that environmental protection has positive consequences" and the "beliefs that the environment is being seriously harmed" can be combined into a "beliefs supportive of environmental action" (BSEA) scale, while the "beliefs that environmental protection has negative consequences" and "beliefs that the environment is not being seriously harmed" can be combined into a "beliefs supportive of environmental inaction" (BSEI) scale. We note here that there are three items which failed to load strongly onto our new interpretation. These are items ACbio3, ACsoc4 and ACbio5, which have either low or inconsistent factor loadings and would be candidate items to be dropped from future work trying to develop the proposed scales.

Table 9 *The items for the four clusters*

Grouping 1a – Beliefs that environmental protection has positive consequences
ACego1: Environmental protection will provide a better world for me and my children
ACego2: Environmental protection is beneficial to my health
ACego5: A clean environment provides me with better opportunities for recreation
ACsoc1: Environmental protection benefits everyone
ACsoc2: Environmental protection will help people have a better quality of life
ACbio4: Tropical rain forests are essential to maintain a healthy planet earth
Grouping 1b – Beliefs that the environment is being seriously harmed
*ACsoc4: The effects of pollution on public health are worse than we realise.
ACsoc5: Pollution generated here harms people all over the earth
ACbio2: Over the next several decades, thousands of species will become extinct
*ACbio5: Modern development threatens wildlife
Grouping 2a – Beliefs that environmental protection has negative consequences
ACego3: Protecting the environment will threaten jobs for people like me
ACego4: Laws to protect the environment limit my choice and personal freedoms
Grouping 2b – Beliefs that the environment is not being seriously harmed
ACsoc3: We don't need to worry much about the environment because future generations will be better able to deal with these problems than we are
ACbio1: While some local plants and animals may have been harmed by environmental degradation, over the whole earth there has been little effect
*ACbio3: Claims that current levels of pollution are changing earth's climate are Exaggerated

* Item that did not consistently load strongly onto factor

Table 10 displays Cronbach's α for the newly proposed subscales. The "environmental protection has positive consequences" scale, despite being a combination of

egoistic, social and biospheric items, demonstrates an excellent reliability coefficient. The BSEI items report poor reliabilities similar to the reliabilities for the egoistic and biospheric subscales (see Table 6).

Table 10 *Cronbach's α for newly proposed subscales*

	Spash Studies	
Scale	Study 1: Non - Random	Study 1: Random
BSEA scale	.88 (9 items)	.88 (9 items)
Environmental protection has positive consequences	.89 (6 items)	.87 (6 items)
The environment is being seriously harmed	.73 (3 items)	.68 (3 items)
BSEI scale	.56 (4 items)	.50 (4 items)
Environmental protection has negative consequences	.45 (2 items)	.44 (2 items)
The environment is not being seriously harmed scale	.40 (2 items)	.35 (2 items)

Table 11 displays the bivariate correlations for the newly proposed subscales. In both samples the "environmental protection has positive consequences" scale and the "environment is being seriously harmed" scale report large positive correlations, which is consistent with the argument that they form part of the higher order BSEA factor. The "environment is not being seriously harmed" scale and the environmental protection has negative consequences" scale also demonstrate large positive correlations, which is consistent with their combination into the higher order BSEI factor. The "environmental protection has positive consequence" scale correlate negatively with both the "environmental protection has negative consequences" scale and the "environment is not being seriously harmed" scale. The "environmental protection has negative consequences" scale is negatively correlated with the "environmental protection has positive consequences" scale, while only having an

insignificant relationship with the "environment is being seriously harmed" scale. All of these correlations are theoretically consistent. While Table 10 displays some large correlations, there does seem to be a significant improvement over the AC subscale correlations (between 0.67 and 0.46) as presented in Table 5. The correlations between BSEA items and BSEI items are much smaller than the correlations between any of the AC subscales.

Table 11 *Bivariate correlations for the newly proposed subscales*

	Spash Studies	
	Study 1: Non-Random	Study 1: Random
BSEA scale & BSEI scale	-.33**	-.30**
Environmental protection has positive consequences & Environment is being seriously harmed	.58**	.61**
Environmental protection has positive consequences & Environmental protection has negative consequences	-.17**	-.14**
Environmental protection has positive consequences & Environment is not being seriously harmed	-.35**	-.38**
Environment is being seriously harmed & Environmental protection has negative consequences	-.06	.02
Environment is being seriously harmed & Environment is not being seriously harmed	-.34**	-.30**
Environment is not being seriously harmed & Environmental protection has negative consequences	-.36**	-.29**

** $p < .001$ * $p < .005$

Confirmatory analysis

A confirmatory factor analysis (CFA) was conducted on the Spash Study 2 sample to compare the alternative interpretation presented in the exploratory analysis section with Stern and colleagues valuation orientation and GAC interpretations. A major strength of a CFA analysis is that it is able to account for the possibility that two scales (e.g. "environmental protection has positive consequences" and the "environment is being harmed") can be combined at a higher level (e.g. BSEA scale). Such a hierarchical relationship may be able to

explain a significantly higher proportion of the variance of the scale than the Principal Axis FA conducted on the AC scale.

The CFA compares Stern's GAC interpretation (model 1), Stern's value orientation interpretation (model 2), the proposed two factor beliefs supportive of environmental action/inaction interpretation (model 3), outlined in the previous section, and the hierarchical interpretation outlined in Table 9. Structural analysis was conducting in Amos 17.0 using the maximum likelihood method. Criteria usually thought to indicate an acceptable fit are: ≤ 3 for χ^2/df, RMSEA $\leq .6$ and the other fit indices (NFI, TLI, GFI, AGFI) $\geq .95$ (Schreiber, Nora, Stage, Barlow, & King, 2006). The CFA conducted on the generally accepted EC scales, however, have reported CFA results where χ^2/df ≤ 4 for, RMSEA $\leq .9$ and the other fit indices (NFI, TLI, GFI, AGFI) $\geq .90$ (see Milfont et al., 2006; Schultz, 2000, 2001; Snelgar, 2006). Nested models can also be compared with the χ^2_{diff} test. Models which are not nested can be compare with the AIC and BIC statistics, where smaller AIC and BIC statistics represent a better model.

When analysing the SEM for the hierarchical model proposed in Table 9, the 2nd order factor "environment is being seriously harmed" was found to report a variance greater than 1 and one of the items on this 2nd order factor also reported a standardised coefficient greater than 1. This suggests that the BSEI scale should not be further divided into 2nd order-factors. The hierarchal model (model 4) is therefore presented as having 2nd order factors for the BSEA scale, but not for BSEI scale (see Figure 5).

Table 12 displays the χ^2 and fit indices outcomes for each model. Figure 2 illustrates the estimated standardised regression weights and the variance of each observed variable for model 1. Figure 3 depicts model 2, with this model also displaying correlations between the egoistic, social and biospheric scales. While model 2 was found to report a significantly

better fit than model 1 [$\chi^2_{diff}(3) = 24.8$, $\underline{p} < .001$], Table 12 demonstrates that both models report similarly poor fit indices.

When compared to model 1, both model 3 [$\chi^2_{diff}(1) = 193.9$, $\underline{p} < .001$] and model 4 [$\chi^2_{diff}(3) = 278.4$, $\underline{p} < .001$] were found to report much better fits. As model 2 did not have a nested relationship with model 3 or model 4, the AIC and BIC statistic were used to compare these models. Table 12 shows that model 3 (see Figure 4) and model 4 (see Figure 5) both reported a lower AIC and BIC statistic than model 2, which indicates these models provided a better fit. Furthermore, model 4 was found to be a significant improvement over the two factored model 3 [$\chi^2_{diff}(2) = 84.5$, $\underline{p} < .001$]. In fact the fit indices for model 4 were found to be as good if not better than the fit indices reported in any of the studies that reported a CFA for the EC scale (Milfont et al., 2006; Schultz, 2000, 2001; Snelgar, 2006).

Table 12 *CFA Measures of fit for four proposed theoretical models*

	χ^2	Df	χ^2/df	RMSEA	NFI	TLI	GFI	AGFI	AIC	BIC
Model 1										
One-factor GAC	481*	77	6.24	.10	.78	.78	.87	.83	537	658
Model 2										
Stern three factors	456*	74	6.16	.10	.79	.78	.88	.83	518	653
Model 3										
Revised two factor	287*	76	3.77	.07	.87	.88	.93	.90	345	471
Model 4										
Revised hierarchical	202*	74	2.73	.06	.91	.93	.95	.93	264	399

Notes: RMSEA = root mean square error of approximation; NFI = normed fit index; TLI = Tucker-Lewis coefficient; GFI = goodness of fit index; AGFI = adjusted goodness of fit index; AIC = Akaike information criterion; BIC = Bayes information criterion.
p < .0001

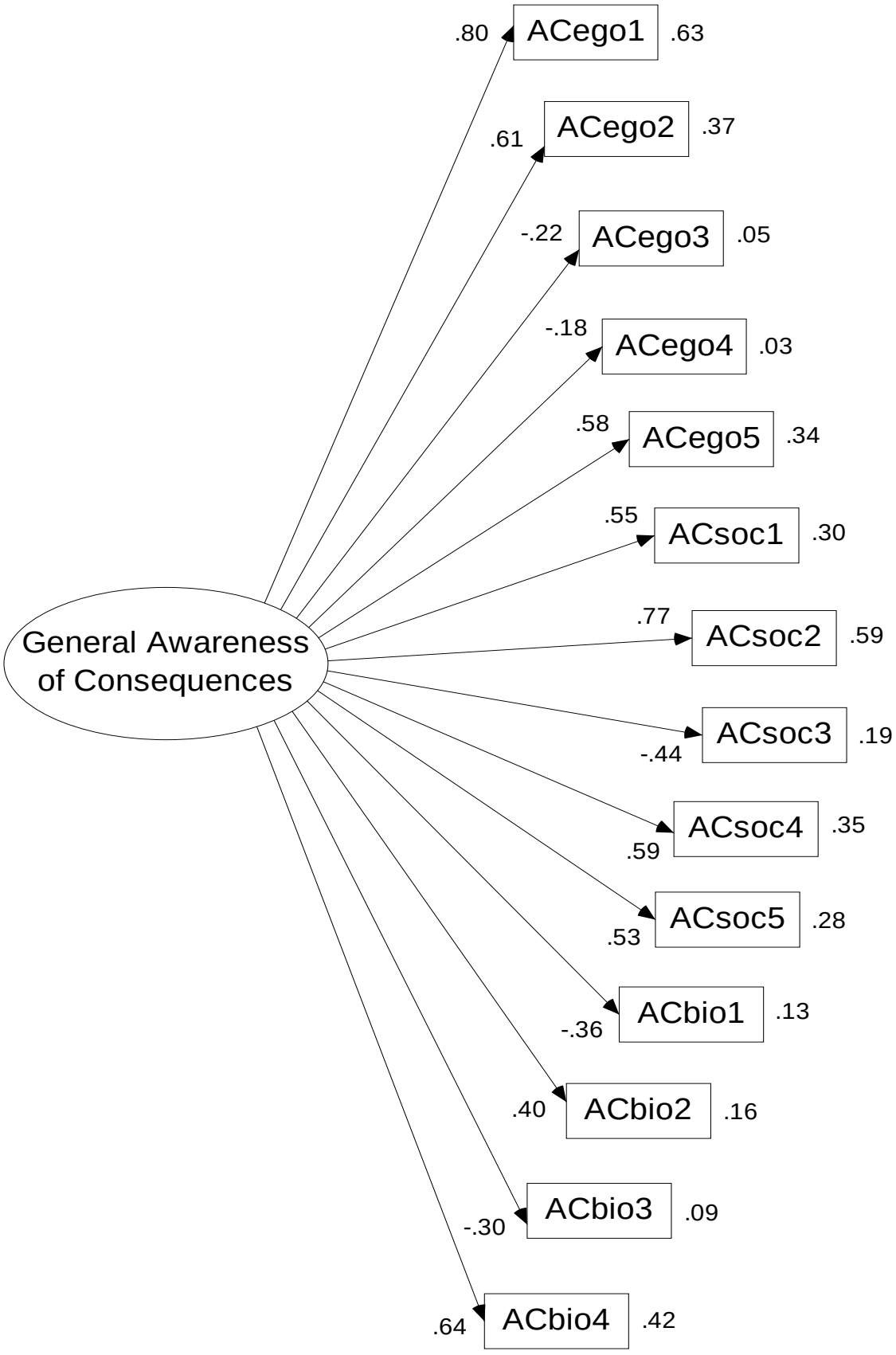

Figure 2. Model 1: The General Awareness of Consequences one factor model (Standardised estimates)

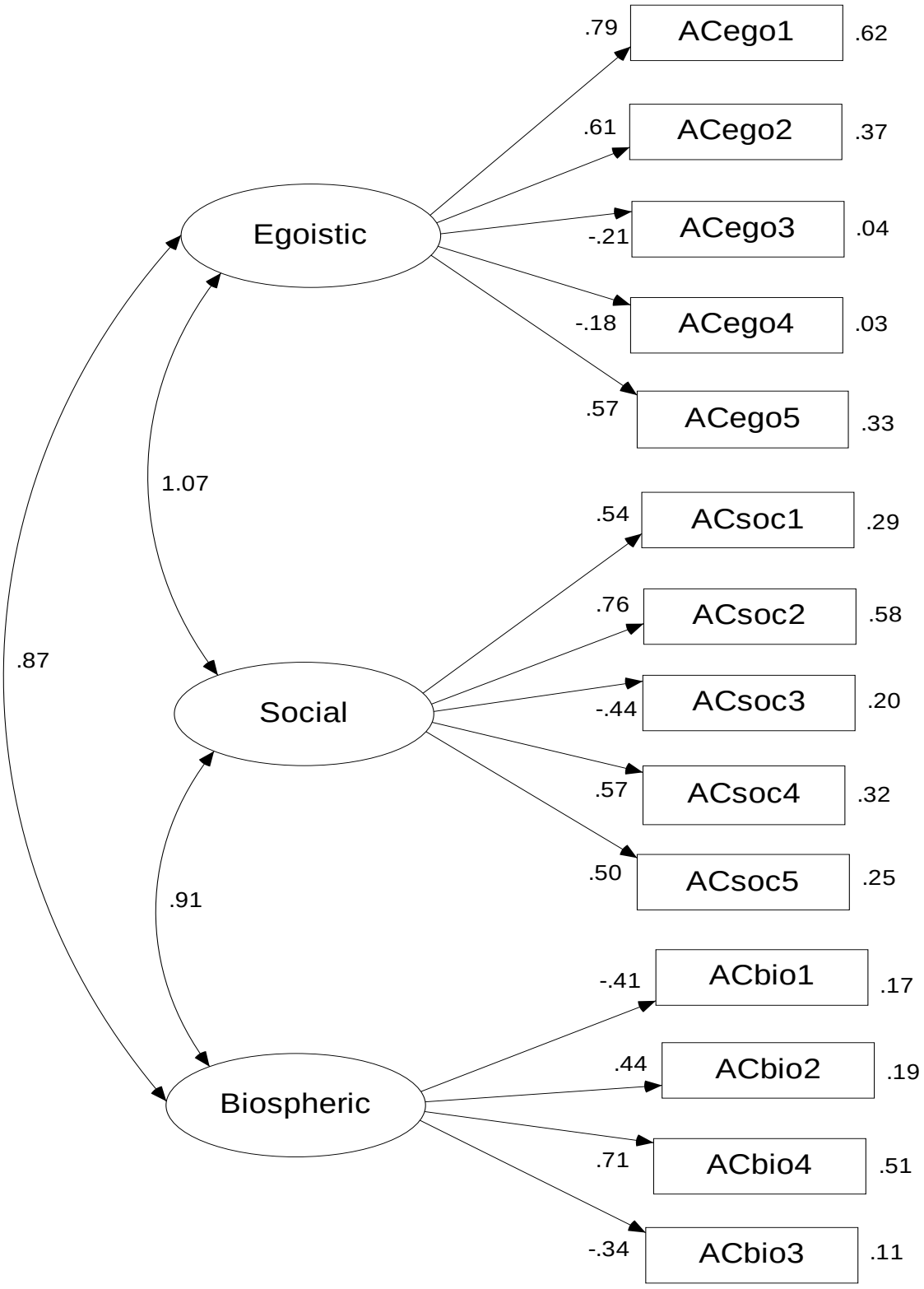

Figure 3. Model 2: The 3 factor Egoistic, Social and Biospheric model (Standardised estimates)

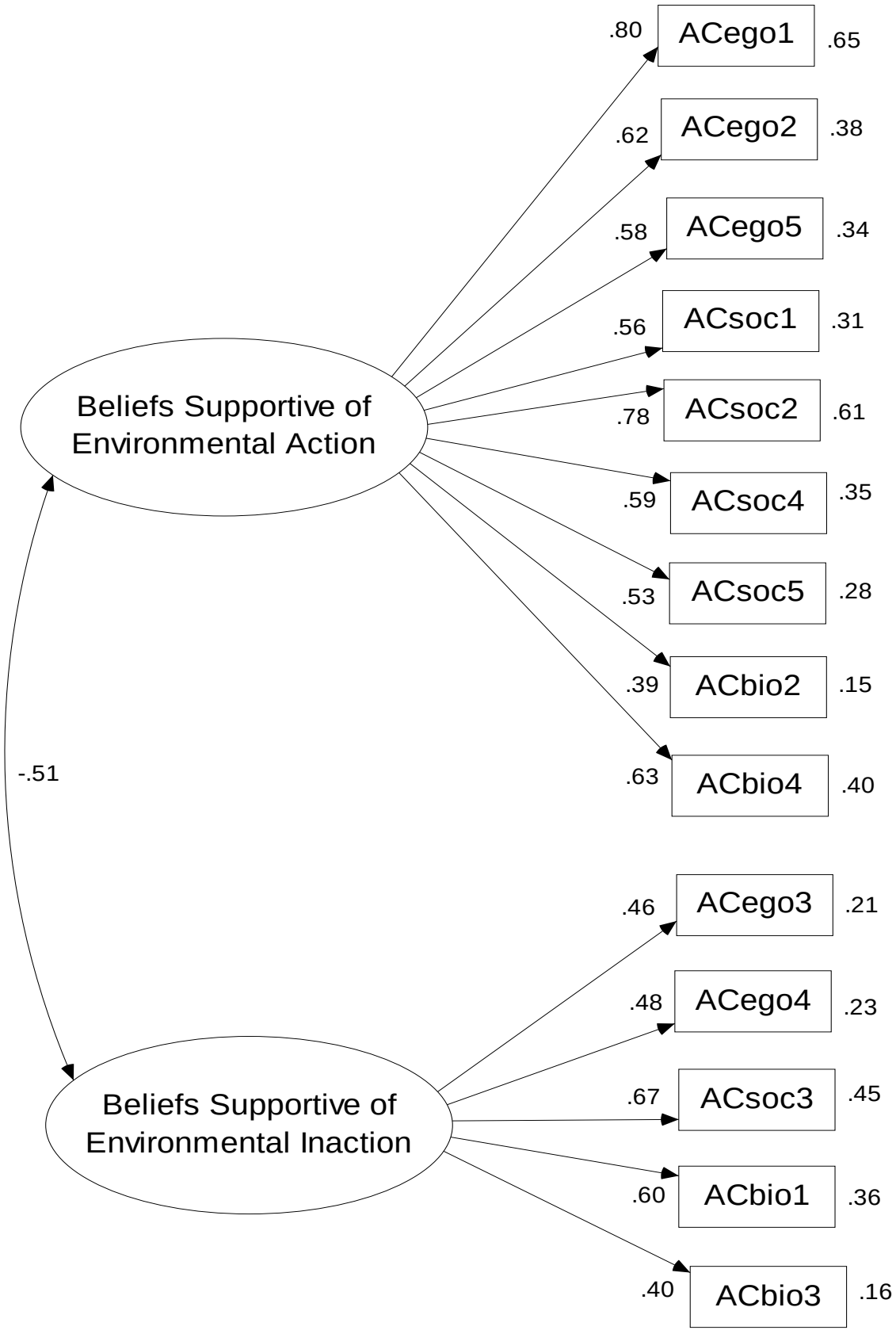

Figure 4: Model 3: The revised two factor model (Standardised estimates)

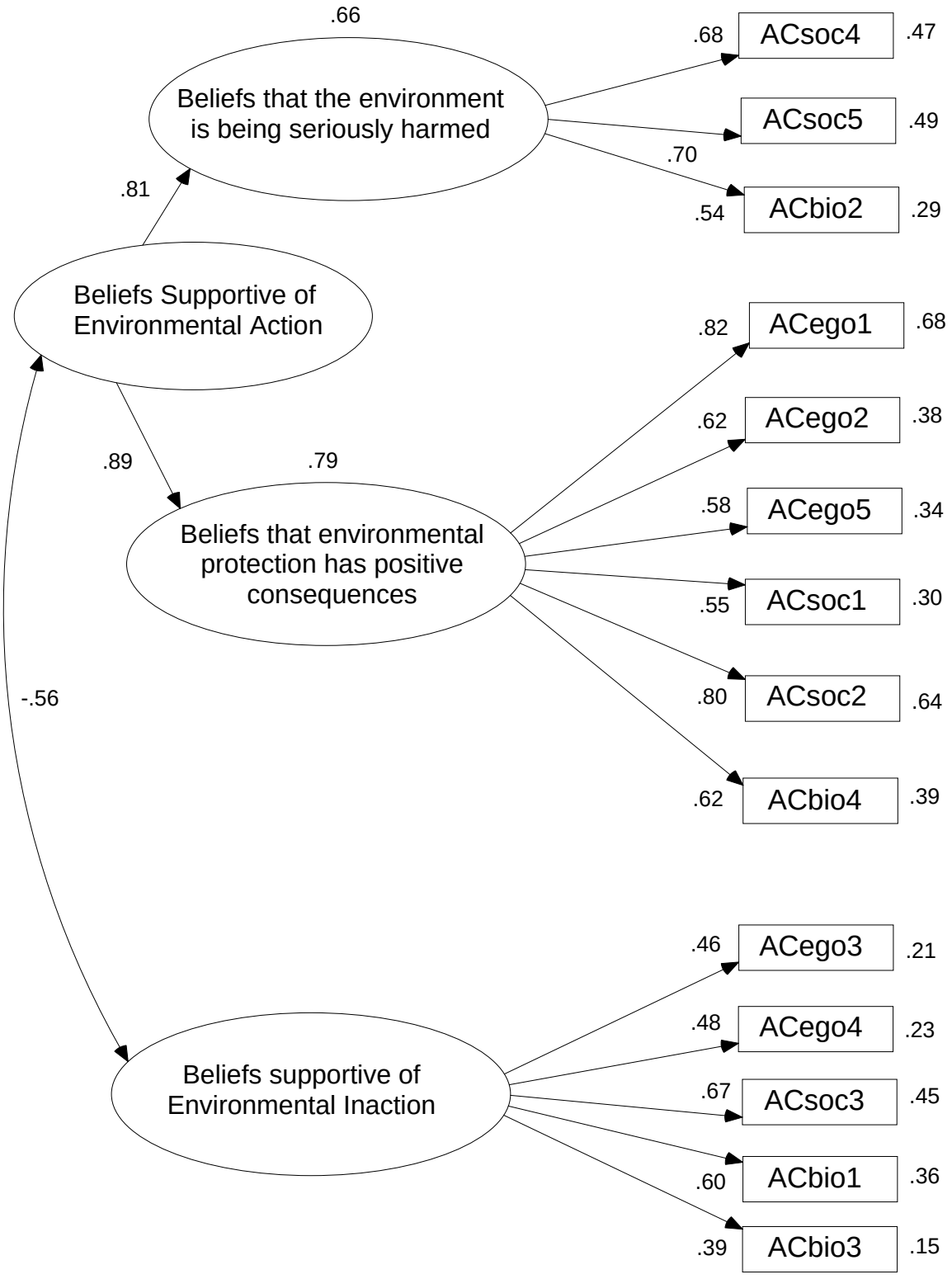

Figure 5: Model 4: The revised 2 stage hierarchical model (Standardised estimates)

DISCUSSION AND CONCLUSIONS

Environmental psychologists investigate human behaviour and how it might be changed to avoid environmental degradation. These constructs when placed into behaviour models can feed into a policy process and influence regulatory design. Behavioural models are often general in nature and can be applied to a variety of topics such as political action, recycling and household water management. The potential for direct policy relevance relates to correctly understanding the key motive and barriers to human action and for some behavioural models this requires outlining an empirically verifiable relationship between "held values" and other environmental cognitions.

Stern et al. designed the AC scale in order to test the proposition that people cognitively differentiate between egoistic, social and biospheric concerns when assessing beliefs about adverse general environmental consequences. The VBN model has made a significant contribution to the environmental attitude-behaviour literature. However, the results of the current study indicate that VBN value orientations are not influential in organising general beliefs about environmental consequences. AC items, which are representative of media statements and everyday comments, and therefore are of general public interest, do not seem to be cognitively organised according to the assumptions of the VBN model.

A questionnaire design that encourages participants to assess their beliefs on emotive and subjective criteria, such as the EC scale, would seem to be required in order to develop a scale that measures such constructs. If this is so, a scale trying to measure VBN value orientations based on general statements of awareness of consequences could not be improved by simply adding more items or designing 'better' items in the same mode. A more emotive approach would be required to increase the salience of an individual's value orientation on the construction of the belief, such as asking participants to assess their

concerns about valued objects. In addition, value orientations may directly influence other emotional cognitions such as environmental norms and expectations.

A revised model is proposed in Figure 6, which is consistent with empirical findings for the current study and Snelgar. Based on the findings of both an exploratory and confirmatory FA, "beliefs supportive of environmental action" appear to be influenced by egoistic, social or biospheric concerns about environmental problems. Furthermore they can be separated into "beliefs about the environment being seriously harmed" and "beliefs about environmental protection having positive consequences". While the current study, unlike Snelgar's, did not find that "beliefs supportive of environmental inaction" can be similarly separated into two components, we suggest this relationship should be further explored.

A possible relationship is that biospheric concerns about environmental problems are negatively correlated with "beliefs that the environment is not being seriously harmed" (or "beliefs supportive of environmental inaction", if no second order factor is found). Social and egoistic concerns about the costs of conservation should be positively correlated with "beliefs that environmental action has negative consequences" (or "beliefs supportive of environmental inaction", if no second order factor is found). In future work there needs to be some account taken of the relationships between environmental concern and environmental beliefs.

Our exploratory and confirmatory FA presents evidence that people have a tendency to differentiate between environmental action and inaction. There is also some evidence that respondents differentiated between the environment being harmed and the benefits of environmental protection. An improved BSEI scale should be developed. The relative weakness of this scale is unsurprising given that it arises from items designed for a different purpose (i.e. to measure AC beliefs). The BSEI scale could therefore be improved by dropping some items (e.g. ACbio3 and ACsoc4), adapting others, and adding new items.

This process would also benefit from working with a far greater number of items than has been typical in research on the AC scale. We note that the confirmatory analysis conducted on hierarchical model 4, which is made up of items which could be refined, reported fit indices on par, if not better than the indices reported for the EC scale.

These findings also shed light on some of the measurement anomalies in the AC scale literature. Where subscale reliabilities have proven satisfactory this may be due to a high proportion of environmental action items. Thus, the AC social subscale has four out of five of its items classified into the BSEA factor and was found to have higher reliabilities than the other subscales. The fact that different concepts are being measured than those assumed by VBN theory also explains why the AC egoistic subscale has previously been found to be insignificantly correlated with the EC egoistic subscale and Schwartz's self enhancement scale. This is also an alternative explanation, to the one factor GAC interpretation, for the high correlations between the egoistic, social and biospheric AC subscales.

The results presented here indicate that the scales being employed to measure egoistic, altruistic and biospheric value orientations actually relate to beliefs about whether environmental action or inaction is required. "Beliefs Supportive of environmental action" can be further classified into "beliefs about environmental harm being serious" and "beliefs that environmental action has positive consequences". Improving a reinterpreted scale as a measure of these concepts seems worthwhile. This suggests a new relationship between environmental concerns and beliefs. A more sophisticated understanding of this relationship could aid environmental policy by supplying a new means of identifying motives behind and barriers to behavioural change.

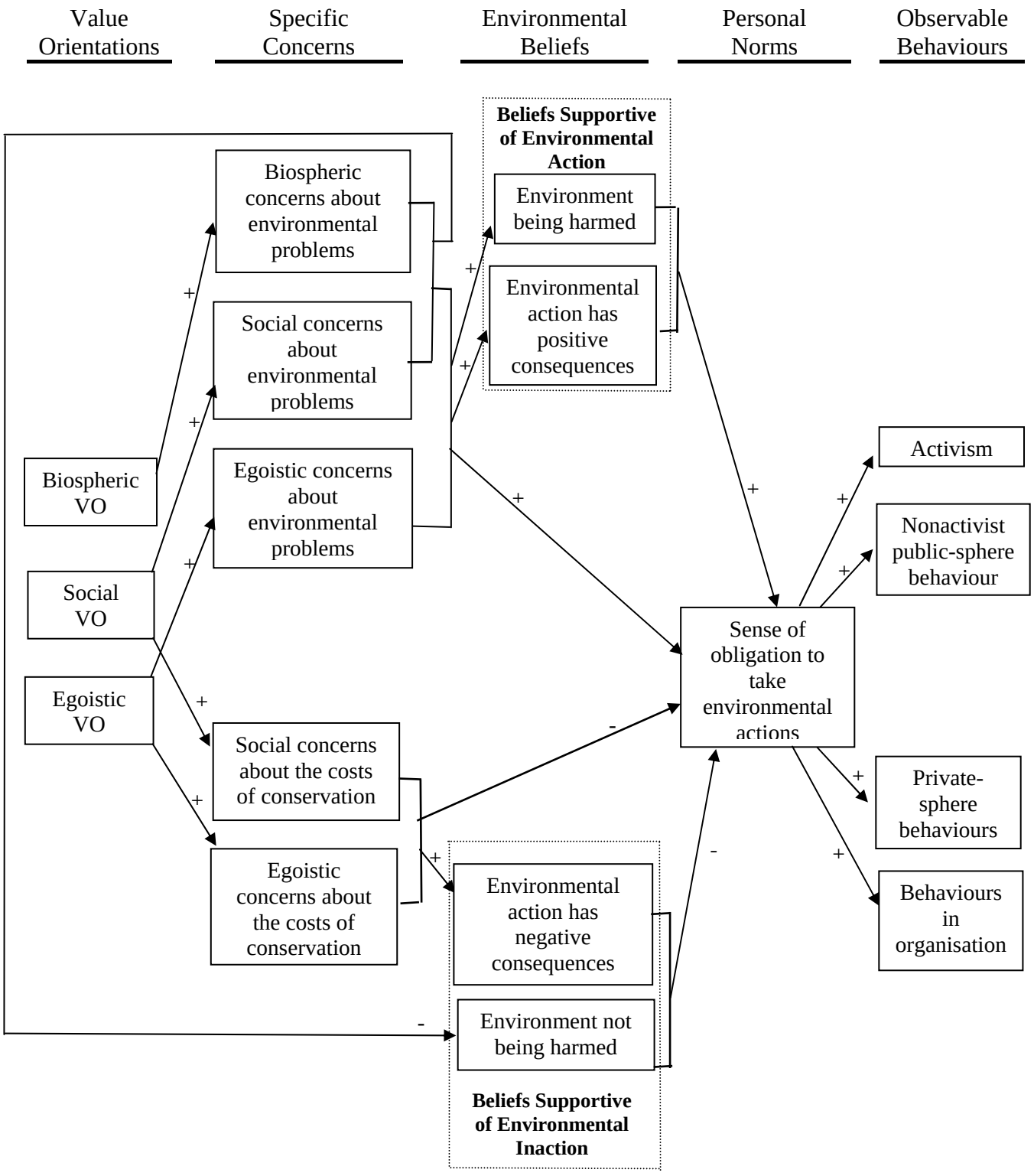

Figure 6. Revised Model

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